

Seroconversion after Hepatitis B Vaccination in Health Care Workers

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ABSTRACT

Background and Objective: Health care workers are the most vulnerable group to be infected with viral hepatitis. At this time there is limited data related to seroconversion after vaccination against Hepatitis B Virus (HBV) especially in the hospital staff. The current study aims to find out the frequency of seroconversion after hepatitis B vaccination in healthcare workers and factors affecting seroconversion.

Methods: A descriptive study was carried out in the Department of Gastroenterology at Fatima Memorial Hospital, Shadman Lahore from November 2015 to May 2016. After taking written informed consent, 250 subjects from various Departments of Fatima Memorial Hospital Lahore were enrolled, who fulfilled the inclusion criteria. Demographic data like name, age, gender, height and weight were recorded. History related to smoking was taken and their body mass index (BMI) was calculated. After completion of course of three vaccines, blood samples were analyzed for quantitative determination of anti-hepatitis B antibodies by Enzyme Linked Immunosorbant Assay (ELISA). A cut off level of > 10 IU/L of anti-hepatitis B antibodies was considered as positive for seroconversion. Data was analyzed in SPSS version 20.

Results: The mean age of subjects enrolled was 43.65 ± 11.64 years. Among seroconverted subjects 40.83% were in 18 – 40 years of age. There was a slight female preponderance of 52% and a male to female ratio of 1:1.08. In 35.2% subjects with history of smoking, 67% had seroconversion. Among 32% of subjects with BMI > 30, 31.25% showed seroconversion. Hepatitis B seroconversion in healthcare workers after HBV vaccination was found in 83.2% subjects. There was a poor response to hepatitis B vaccine in smokers.

Conclusion: Frequency of hepatitis B seroconversion in healthcare workers after HBV vaccination is higher however smoking is a significant risk factor which hinders seroconversion after anti hepatitis B vaccination.

KEYWORDS: Hepatitis B virus, Healthcare workers, Vaccination, Seroconversion, Enzyme linked immunosorbant assay.

INTRODUCTION

Hepatitis B Virus, belonging to Hepadnaviridae family, is the major culprit of Hepatitis B infection.¹ According to World Health Organization (WHO), 257 million people had chronic hepatitis B infection in 2015. In the same year, a total number of 887 000 deaths occurred due to hepatitis B, mostly from cirrhosis and hepatocellular carcinoma (HCC). By 2016, only 16.7% of the people diagnosed with hepatitis were taking treatment. According to WHO South-East Asia Region, an estimated 2.0% of the general population is HBV infected.² In Pakistan, the overall prevalence of hepatitis B was 2.4%. The highest prevalence of hepatitis B infection was found in the province of Baluchistan i.e. 4.3% followed by the province of Sindh (2.5%). On the contrary, the highest prevalence of

hepatitis C was found in the province of Punjab i.e. 6.7%.³

Global annual proportion of health care workers, exposed to HBV is 5.9% corresponding to a total of 66,000 cases in number.⁴ Health workers are at four fold higher risk of getting HBV infection as compared to general population since they are prone to get accidental pricks and are exposed to blood and body fluids. If an unvaccinated person gets HBV infected needle prick, there is 6-30% risk of getting HBV infection.⁵

Needle stick injury, piercing, sexual intercourse and transmission to baby during birth are main modes of transmission of HBV because blood and other body fluids like tears, saliva, vaginal secretions and semen are carriers of HBV.² An efficacious measure to reduce the incidence of hepatitis B infection is vaccination

against the viral antigen. A study from Gambia showed that vaccinating infants against HBV reduces the burden of HBV-related diseases by > 80%, and it is a highly cost-effective health intervention.⁶

The efficacy and safety of hepatitis B vaccine has been thoroughly documented in multiple literatures, however need of booster doses is debateable.⁷⁻⁹ There are protective antibodies produced once a complete course of antibodies is given intramuscularly at three different times. It has also shown detectable level of antibodies even up to 15 years later. Around 99.4% subjects show an excellent immune memory capable of an anamnestic response when challenged with a booster dose of vaccine.¹⁰ Factors which give trifling response to hepatitis B vaccine are multiple and the common ones are male gender, smoking, BMI > 25, age > 60 years and comorbidities.¹¹

Rationale of this study is to observe the seroconversion after hepatitis B vaccination in healthcare workers since this group is at higher risk of getting infection from needle pricks and contact with body fluids. Furthermore scarce local data is available on this subject hence strategies may be planned for regular incorporation of checking seroconversion in hepatitis B vaccinated individuals.

METHODS

A descriptive case study was carried out on healthcare workers at Fatima Memorial Hospital, Lahore in the Department of Gastroenterology, from November, 2015 to May 2016 after approval from institutional Ethical Review Board. Using consecutive non probability sampling technique, a total of 250 subjects were selected with 95% confidence level and 5% margin of error. Vaccinated subjects from both genders and aged between 18-65 years, who underwent full course of hepatitis B vaccination on recommended schedule i.e. on 0, 1 & 6 months and presented for receiving last dose of vaccine were included in the study. Subjects with active hepatitis B (i.e. worker with positive Anti-HBV IgM, deranged liver function tests like ALT, AST > 40 IU/L or viral load more than twenty thousand copies per ml), who have undergone any treatment for hepatitis B or have taken more than one course of vaccination or subjects on hemodialysis or are immunocompromised, were excluded. Workers with Human immunodeficiency virus infection and acquired immune deficiency syndrome, any malignancy and/or with history of organ transplant were excluded from this study. A total of 250 subjects fulfilling the inclusion criteria from various Departments of Fatima Memorial Hospital Lahore were included after taking written informed consent. Demographic data like name, age, gender, height and weight was recorded. History about smoking was taken and their BMI was calculated. After completion of vaccine course, a blood sample of 2.5 ml

was drawn and sent to laboratory of Fatima Memorial Hospital in sample bottles containing clot activator. Enzyme-linked immunosorbent assay technique (ELISA) was utilized for determination of anti-hepatitis B antibodies using Abbot Architect Plus automated analyzer. Reports were collected after two hours after verification by expert pathologist. A cut off level of > 10 IU/L of anti-hepatitis B antibodies was considered significant i.e. person was considered seroconverted.

STATISTICAL ANALYSIS

Data was analyzed in SPSS version 20. Mean with \pm standard deviation was calculated for quantitative variable like age and BMI. Frequency and percentages were calculated for qualitative variables like sex, smoking status and number of persons who are seroconverted. Stratification for age (18 – 40) & (41 – 65), BMI, smoking and gender was done to control the effect modifier. For determining any significant difference between the stratified groups, the Chi-Square test was applied hence taking *P-value* ≤ 0.05 as significant.

RESULTS

A total of 250 cases, fulfilling the inclusion/exclusion criteria were enrolled to determine the frequency of Hepatitis B seroconversion in healthcare workers after HBV vaccination. Mean age of the subjects was 43.65 ± 11.64 years. Age distribution of the patients shows that 42% (n = 105) were between 18 – 40 years of age while 58% (n = 145) were between 41 – 65 years of age. There were 48% (n = 120) males and 52% (n = 130) females with a male to female ratio of 1:1.08. Frequency of hepatitis B seroconversion in healthcare workers after HBV vaccination was recorded & given in (Table- 1).

Table-1: Frequency of hepatitis B seroconversion in healthcare workers after HBV vaccination.

Hepatitis B Seroconversion	No. of Patients	Percentages
Yes	208	83.2
No	42	16.8
Total	250	100

The stratification for age shows that out of 208 subjects with seroconversion, most of them were in the age group of 41 – 65 years (*P-value* = 0.41). As far as gender is concerned, out of all the seroconverted individuals, the females were 46.1% and males were 53.84% (*P-value* = 0.19); their association was again statistically insignificant. The stratification for smoking shows that among the seroconverted healthcare workers, 59.6% subjects had no history of

smoking ($P < 0.01$). Similarly, 68.75% of the seroconverted subjects had BMI < 30 (P -value = 0.57). All these results are detailed in the (Table-2), given below.

Table-2: Factors effecting seroconversion after hepatitis B vaccine.

Factor	Groups	Hepatitis B Seroconversions		P-value
		Yes	No	
Age (years)	18-40	85	20	0.41
	41-65	123	22	
Gender	Male	96	24	0.19
	Female	112	18	
Smoking	Yes	59	29	0.00
	No	149	13	
BMI* (kg/m ²)	< 30	143	27	0.57
	> 30	65	15	

*Chi square test

DISCUSSION

HBV infection is a notable and frequently encountered occupational risk to healthcare workers. Although it is considered as a preventable disease if a prior HBV surface antigen (HBsAg) vaccination is given. A valid evaluation for evidence of protective immunity in the form this vaccination is imperative, though a few vaccines fail to develop adequate levels of antibodies against this particular antigen (anti-HBs) due to multiple reasons. A level of ≥ 10 mIU/ml is taken into consideration for anti-HBs as secured in anticipation of HBV infection.¹²

This study was planned in order to ascertain seroconversion following vaccination for hepatitis B in healthcare providers. There are multiple reasons for that, such as this group is at higher risk of getting infection from needle pricks and contact with body fluids. Also due to dearth of relevant data in the local population, this pertinent matter needs attention.

In the present study, the age of 42% (n = 105) of healthcare workers was in a range of 18-40 years while 58% (n = 145) subjects were in a range of 41 – 65 years. The male to female ratio was 1:1.08. The frequency of hepatitis B seroconversion in healthcare workers after HBV vaccination was recorded in 83.2% (n = 208) subjects. The results of this study about hepatitis B vaccine's effectiveness and safety are comparable with that of studies in which the subjects received the full 3-doses and developed protective antibodies.^{7,8}

A study conducted in Sri Lanka on a group of healthcare workers reported 90% subjects as seroconverted after complete course of hepatitis B vaccination.¹³ According to another study Anti-HbS titer was found to be more than 10.0 IU/L in 70.7% of medical staff.¹⁴ These findings are concurrent with the present study.

In vaccinated health workers at tertiary care center various parameter like prevalence, epidemiological significance, serological reactions and risk factors were studied and they determined that there was a higher seroconversion in health workers who were given complete regime of HBV vaccines. In workers with positive serology, the factors showing greatest risks were time in service and work-related injuries.¹⁵

Another local study showed promising immune response when vaccinated against HBV in healthcare providers. According to their results, among a total of 652 health care providers, 90 (14%) did not show seroconversion after three doses of vaccination. The subjects failing to show the seroconversion were 9% in < 25 years of age, and 63% in subjects > 50 years of age. The seronegative females (8%) were less frequent compared to the males (18%).¹⁶ The frequency of non-responders to vaccination in current study are in agreement with this study.

The authors are of the view that the rate of seroconversion after HBV vaccination in the health providers at teaching hospital in Lahore was in accordance to that reported in Western inhabitants. However those showing no immune reaction to HBV vaccine are at greater risk.

CONCLUSION

Hepatitis B seroconversion in healthcare workers after HBV vaccination is higher and it is recommended that vaccination should be done in all health care workers. Smoking is however associated with poor response to HBV vaccination. Results of this study will accentuate a need for future studies to not only validate but also to find out deficits in the recent vaccination regimes especially for the ones who failed to achieve seroconversion.

LIMITATIONS OF STUDY

This study may be supplemented with possible future larger scale surveys in order to strengthen the conclusions drawn about study topic under discussion.

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AUTHOR'S CONTRIBUTION

RM: Conception of study and drafting the article.

MK: Acquisition, analysis and interpretation of data.

KS: Drafting and critical revision of article for important intellectual content.

MJM: Acquisition, analysis and interpretation of data.

YS: Acquisition of data and drafting the article.

CONFLICT OF INTEREST

None to declare.

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None to disclose.

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